The Future of 4.9 GHz

WT Docket No. 00-32

July 28, 2004

NPSTC
and
Cisco Systems
Tropos Networks
Nortel Networks
PacketHop, Inc.

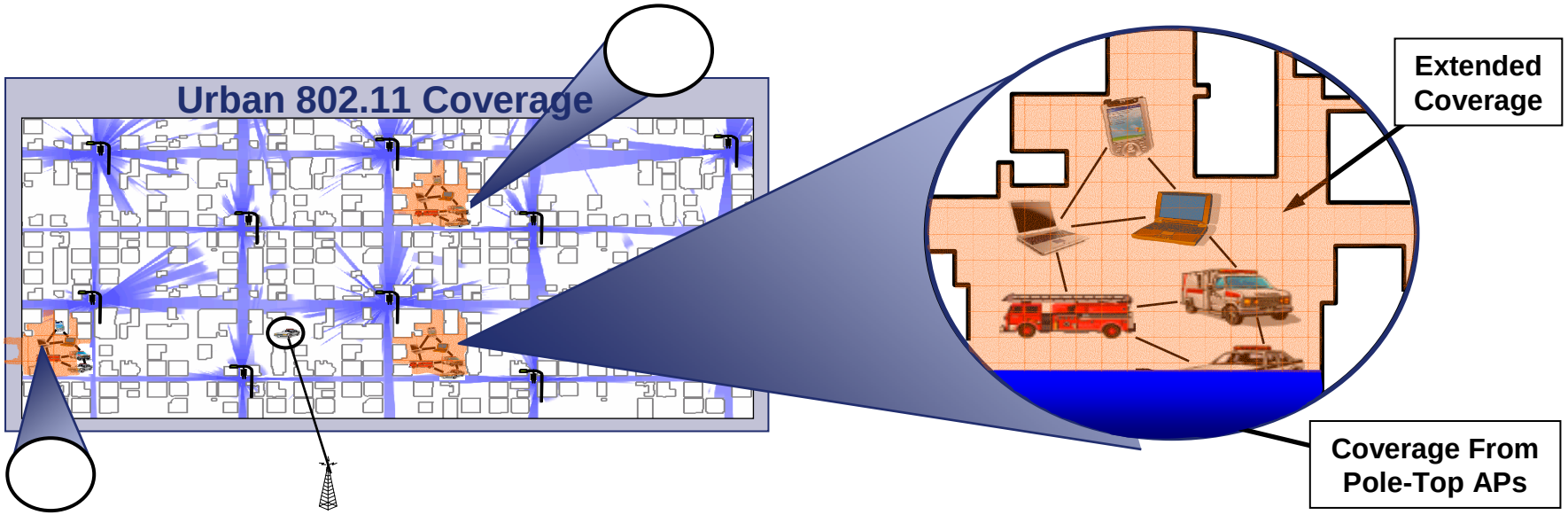
Purpose of the Meeting

Make a case for Reconsideration Order

1. **Approve mask A at or below 20dBm**
2. **Above 20dBm – experimental licenses will yield more information on operational performance for masks A and C**

Goal

- **Provide cost-effective mission-critical broadband services to Public Safety leveraging standards-based COTS technologies**



- **802.11 infrastructure deployments are expanding beyond traditional “hot spots” and are being deployed across entire metropolitan areas in a cellular-like manner**
- **Client devices running mesh networking software are able to complement pre-placed infrastructure and extend the network and the services offered to users**

Public Safety Already Embracing 802.11

- Los Angeles, CA PD: 27 WLANs at police stations throughout the city (pop. 3.8 million)
- Columbus, OH PD: linked city PD to surrounding PDs (pop. 711,500)
- New Orleans, LA PD: police surveillance (pop. 484,700)
- Aurora, CO PD & FD : 300 mobile police and fire units (pop. 300,000)
- Syracuse and Onondoga County, NY PD: (pilot) (pop. 164,000)
- San Mateo, CA PD: metro scale, WiFi mesh network (pop. 92,500)
- Buffalo Grove, IL PD: patrol cars & mobile incident command (pop. 42,900)
- North Miami Beach, FL PD: metro area network (pop.40,800)
- Post Falls, ID PD: 23 access points with up to 5 mile radius; 22 patrol cars (pop. 20,000)
- Isle, MN PD: 7 member police force equipped with 802.11b (pop. 700)

Competitive Market Forces

- **Open standards-based, commercial wireless networking technology is proven and exists from a multitude of vendors**
- **Large vendor community and competition breeds innovation**
  - **Expanded capabilities such as IEEE 802.11e, i, n, r, s**
- **Competition promotes competitive prices**
- **End-users can be creative and use new technology and applications as they become available (e.g., PDAs, VoIP over WLANs)**

Public Safety Can Benefit From Standards

- **Public Safety will significantly reduce the supplier community if it requires a specialized solution where it is the only market interested in such products**
- **Public Safety would benefit from the rapid innovation and standards being driven by much larger markets than the PS community.**
- **Mask A already exists and is used in 5 GHz products. If Mask C is required, multi-band capability and flexibility cannot happen.**

Public Safety cannot assume it will have competitive suppliers if it requires a specialized solution – vendors will simply choose not to supply to this market

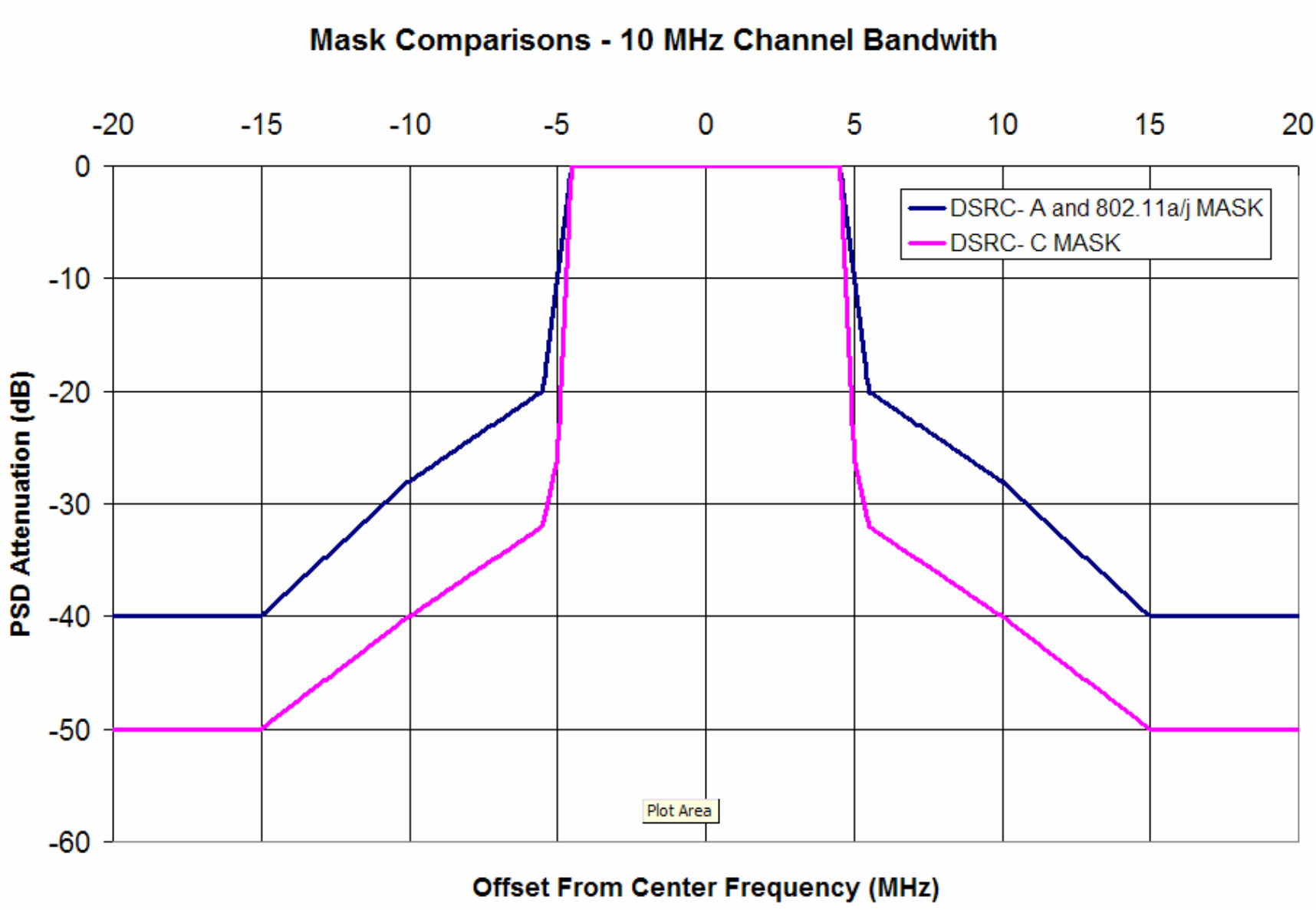
- **Therefore Public Safety should not require specialized radio products for broadband**

802.11 Promotes Efficient Spectrum Usage

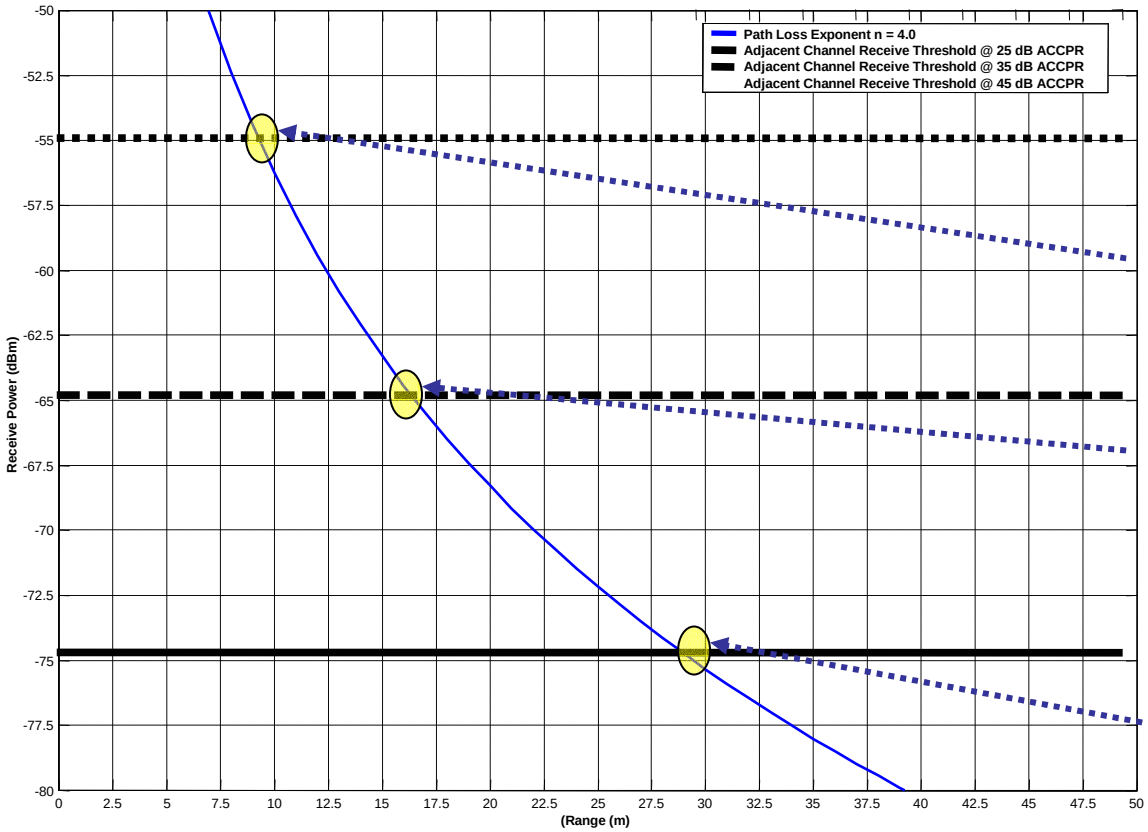
- **Transmit power control promotes frequency reuse**
- **Listen-before-talk promotes efficient band sharing**
- **Capable of automatically selecting clear channel**
- **Interference results in lower data rates, not complete loss of service**
- **Common radio with a single mask operating in 4.9-5.9GHz bands benefits public safety communications**
  - Common mask for multiple frequencies enables band manager to move non-critical communications to UNII band

Technical Considerations

- Suitable mask should be decided based on operational performance for packet data systems
- 802.11 masks are proven to be commercially successful worldwide


Mask Comparisons - 10 MHz Channel Bandwith
-20
-15
-10
-5
0
5
10
15
20
0
-10
-20
-30
-40
-50
-60
PSD Attenuation (dB)
DSRC- A and 802.11a/j MASK
DSRC- C MASK
Plot Area
Offset From Center Frequency (MHz)

Adjacent Channel Effects



Adjacent Channel Interference Range

DSRC-d
~ 8 m

DSRC-c
~ 17 m

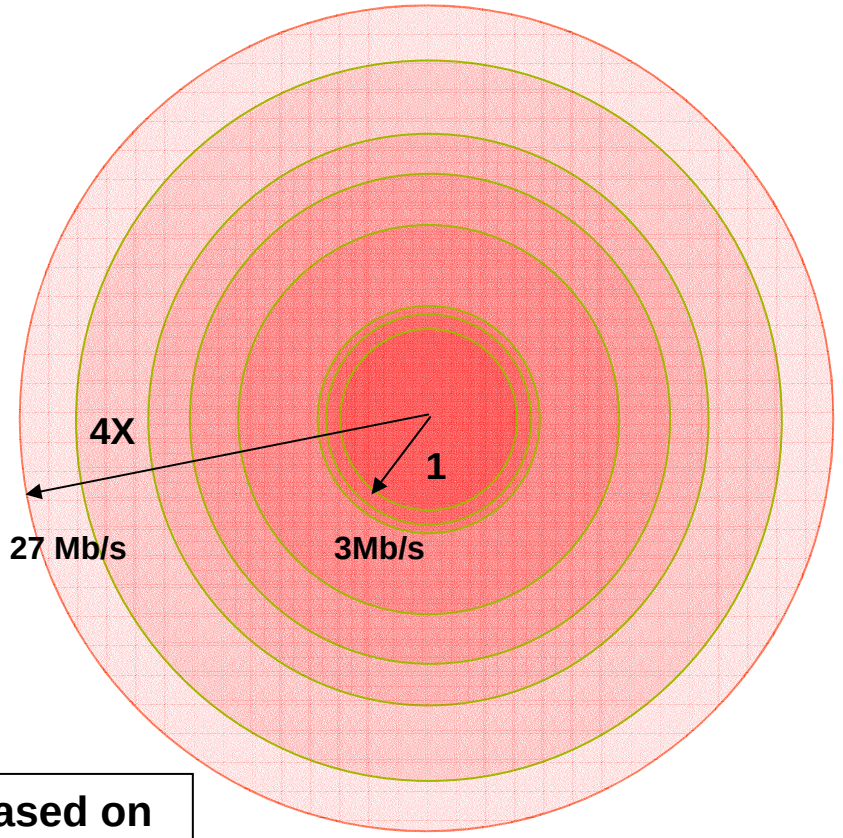
802.11a/j or DSRC-a
~ 28 m

Colocated mobiles and APs in simultaneous operation: first adjacent channel effects

The higher the data rate desired, the smaller the operational range.

1. To maintain both operational range and high throughput, the adjacent channel operation will need to be moved to create geographic separation.

If one transmitter is allowing 3 Mb/s at 1 unit of distance from an AP, that transmitter would need to be moved to 4 units of distance from the AP to allow 27 Mb/s throughput.



Values are to scale

2. Size of operational ranges will vary based on local propagation conditions.

Adjacent Channel Effects

- **Concurrent unrelated operations in adjacent channels in the same place are unlikely and can be managed**
  - **Single AP hot spots: No adjacent channel interference**
  - **Pre-installed infrastructure: Channel use is already coordinated**
  - **Isolated APs coming together: will be administratively managed in virtually all situations using on-site coordination using available channels**
- **Mask A will support same fixed reuse pattern as mask C**
  - **Specialized user needs for additional adjacent channel protection can be met by enhanced receiver performance, as already provided in DSRC standard, instead of constraining all transmitters in this band**
- **In IP-based systems, interference results only in reduced throughput (Ex: WLANs)**
- **Use of high gain directional antennas with higher power nodes reduces interference further**

Out Of Band Emissions

Adoption of mask A will <u>not</u> impact out of band emissions

Prompt FCC Action Required

- **Time is of essence**
  - **Public safety community is issuing numerous RFPs for mobile broadband services**
  - **Vendor community needs quick decision for participation**
  - **Helps RPCs to develop realistic service plans and band usage plans**
  - **Implementation of currently available wireless broadband technologies quickly enables advanced Homeland Security applications**
- **Issue a Reconsideration Order expeditiously**
  1. **Approve mask A at or below 20dBm**
  2. **Allow experimental licenses above 20dBm to gather more information on operational performance at higher power**